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Gocrete: A company limbers up for the future

In March 2008 the most modern production facilities for precast concrete elements came into operation at the Gocrete factory near Perth in Western Australia. Precast floor slabs and solid walls are now economically produced in an extremely small production space, in accordance with the latest Occupational Health and Safety Regulations.

■ Hans-Jörg Vollert,
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Gocrete Pty. Ltd. is a 100 % subsidiary of the Australian corporate group Boral, the biggest Australian group in the construction industry. Boral generates a turnover of 5.2 billion AUD corresponding to approx. 2.6 billion EUR and employs more than 15 900 people.

Gocrete commenced operations in the early 80's, as a family run transport business, with a single mixer truck and a mobile mixing plant in Perth. Today Gocrete is one of the most important suppliers of both ready-mixed concrete and precast concrete components on the Australian west coast employing more than 80 people.

In 2006 internal studies from Boral revealed that the need for precast concrete components in the region of Western Australia would continue to grow permanently. A greater number of building companies were using precast concrete components as a cost effective and rapid building method to produce high quality and sophisticated precast buildings. The requirements regarding dimensional accuracy and surface quality, continued to grow to the same extent, to ensure a quick final installation. With the stationary production plant, that Gocrete operated at this point in time, neither the increasing needs for quality and quantity of precast components could be



Fig. 1: Apartment house in Perth

covered, nor meet the increasing requirements for occupational health and safety regulations.

Gocrete had already developed a partial precast concrete system for ceilings – the “formfloor system” in the past. This system consists of a 60 mm concrete layer as well as lattice girders, completed on site with reinforcement and poured with ready-

mixed concrete. This system is mainly used for the construction of apartment houses as well as two-storey residential buildings which is meanwhile widely spread in Western Australia.

Therefore in August 2006 the Boral group contacted Vollert/Weckenmann to request the transfer of a second-hand precast floor slab production plant to Australia and re-commission it there.

The requirements were to produce not only flat ceilings but also ceilings with raised edges as well as solid components. In its capacity as a pilot factory for Boral the degree of automation to be provided was rather low, but it had to have the possibility to be expanded.

The option to produce double walls was also to be included. The spatial conditions were limited due to the expansion area available to Gocrete.

This quickly and clearly revealed that the second-hand plant could not comply with these criteria at economically justifiable conditions. Despite the tight budget, however, all participants in the project succeeded together to find an extremely economic and future-oriented solution:

- The existing stationary production on tables was only to be used for special components and parts that cannot be produced economically within a circulation process.



Fig. 2: Apartment house in Perth



Fig. 3: Apartment house in Perth under construction

- For the production of floor slabs, floor slabs with raised edges and solid components a flexible, extensible pallet circulation plant designed for the smallest of spaces has been developed.

Due to the strict occupational health and safety regulations in Australia and the leadership role that Boral plays in this area, this new plant represents a large step forward .

All Western Australian safety regulations could be complied with by the new plant as well as special regulations for mechanical and electrical systems required by Boral as large worldwide corporate group.

Another important effect are the staff savings to be realized with a circulation system. Since in Western Australia nearly full employment prevails - unimaginable for many countries - this represents an important competitive advantage.

Project Workflow

In January 2007 after the contract signing and the settlement of all commercial formalities the official project starting signal was given. In the next 15 months following thereafter until the final acceptance, the entire team involved in the project cooperated in a close and trustful atmosphere.

Several coordination meetings were held during the project period not only in Germany but also in Australia. In addition to the experiences gained from other concrete factories and plants in Australia, which the Vollert/Weckenmann engineers brought, it proved to be particularly advantageous that Boral employed a competent project engineer full-time for the whole project.

Figures 4-7 show the construction progress from the hall to the arrival of the machine components:

Stationary Production

Most of the produced precast elements are manufactured on the new pallet circulation plant.

As it is of great importance for Gocrete to fulfil the custom requirements and be able to offer a complete customer solution, the stationary production had to be reorganized. In the hall where the complete precast production took place in former times, only special elements or particularly time-consuming parts are produced today.

Pallet Circulation Plant

The requirements of the customer on the circulation plant consisted of producing, in addition to the 60mm high floor slabs and 200 mm high solid walls, floor slabs with raised edges up to 400 mm with the same facility.

The plant is designed for an output of 700 m² of floor slabs per 8-hour shift. A system height of the complete floor moving technology of 320 mm ensures a trouble free access to the shuttering surfaces. The complete system is designed for a concrete weight of 12 tons. The greatest challenge to be envisaged, in view of the available confined spatial conditions and tight budget, has been to create a flexible plant that can be extended in future and at the same time have a moderate degree of automation.



■ Dipl. ing Hans-Jörg Vollert studied production engineering at Karlsruhe Technical University (TH). Since 1999, managing shareholder of Vollert Anlagenbau GmbH + Co KG with headquarters in Weinsberg.

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Fig. 4: Preparation for the foundation works



Fig. 5: Steel structure of the hall



Fig. 6: Hall cladding with precast concrete components



Fig. 7: Completion of the floor plate

Due to cost and quality reasons, Boral decided to procure the curing chamber steel structure and the pallets completely from Germany. A cost comparison with local production suppliers at site resulted in the fact that a supply from Germany with the required quality criteria, made more sense from a business point of view than production in Australia.

Lifting

The floor slabs are lifted with a specially designed horizontal lifting device. For the lifting of the walls a special traverse is used on the hall crane. Hall crane and lifting device use the same running path. All necessary preparations were made in the foundation for the later retrofitting of a tilting table

Demoulding

The demoulding station is equipped on both sides of the shuttering pallet with platforms enabling an even access to the pallet. The solid wall shutters and the floor slab shutters are set down on two different shuttering transport conveyors, completely cleaned, oiled for being transported to the shuttering storage at the working station U02. On the two sides of the precast concrete shuttering with integrated magnets, different sizes of precast concrete component can be produced.

The solid wall shutters have been developed together with Boral as a flexible and cost-effective system. The basic shutters with integrated magnets can be enlarged individually with the appropriate attachment shutters to produce both different heights and geometries.

The two shuttering systems are realized with reusable plastic adaptors, the so-called X-gap-system connecting the transversal with the longitudinal shutters so as to avoid the use of expensive polystyrene with its problematic waste disposal.



Fig. 8: Stationary production

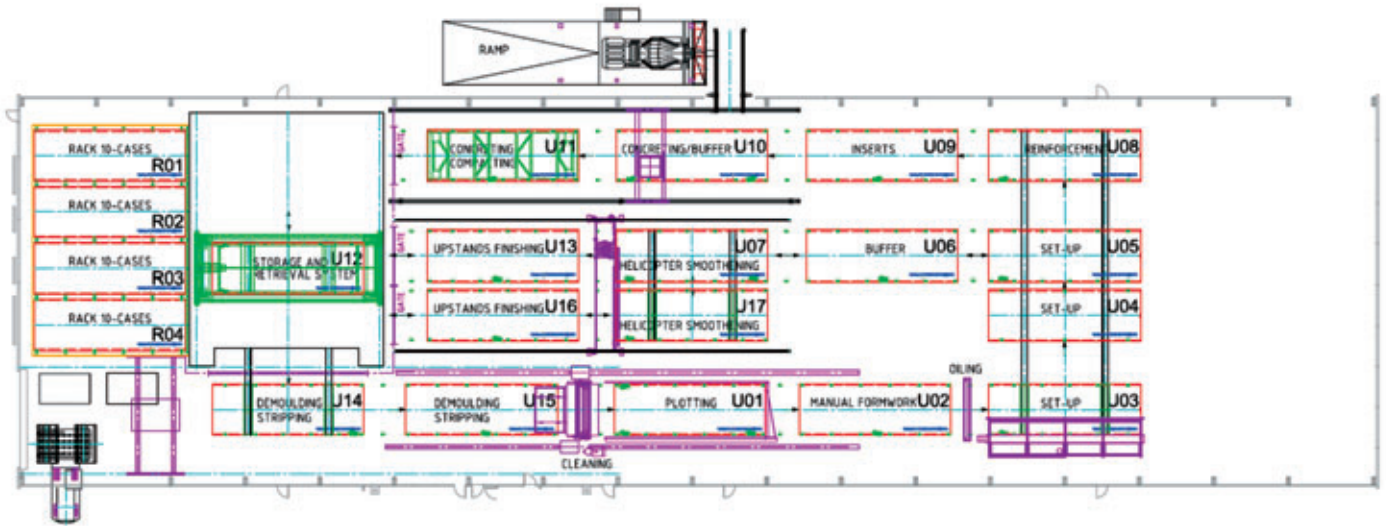


Fig. 9: Layout of the plant

Cleaning /Automatic Plotting

After the automatic pallet cleaning the contours of the components and the insertion elements are fully automatically plotted. The plotter receives the technical data by means of visualization directly from the Nemetschek Allplan CAD system used by Gocrete. Space for the later retrofitting of a shuttering robot is already provided.

Shuttering

At station U52, a complete working station system has been installed consisting of racks, a shuttering storage as well as a manually movable tool carriage with integrated hot glue gun and hand oiler. All shuttering works are carried out here. After shuttering the pallet runs through an oiling machine where oil is spread all over the shuttering surface.

Reinforcement and Positioning of Built-in Parts

The stations from U05 to U09 are used to put in the reinforcement. For this purpose standard steel meshes are prepared in the reinforcement preparation zone, on particular workstations to either cut the meshes to size or remove recesses. The lattice girders for the formfloor system are also installed in this area.

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Fig. 10: View on the pallet circulation plant



Fig. 11: Solid wall shuttering transport system

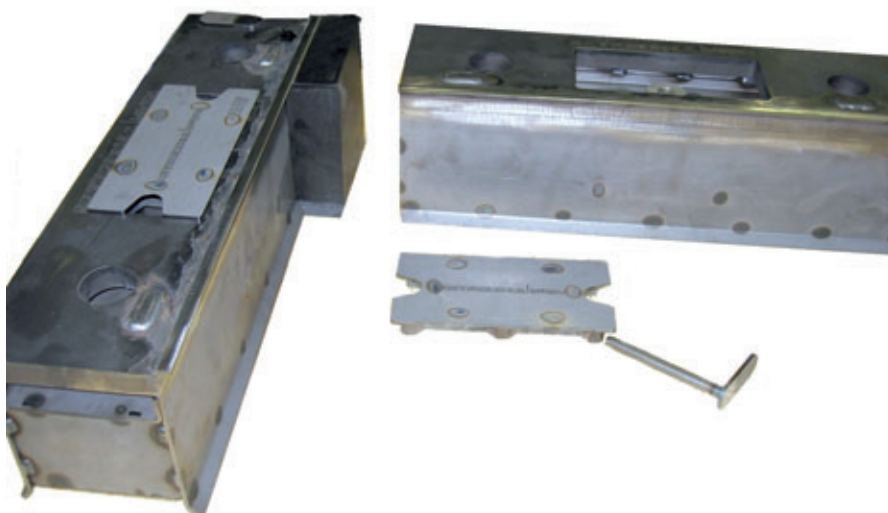


Fig. 12: Gocrete is using solid wall attachment profiles

Concreting

The concrete is mixed in the company-owned mixing plant on the same factory site and transported with the truck mixer to the precast concrete factory. For filling, the concrete distributor runs via a branch line out of the hall. Using a ramp the truck mixer discharges directly from the top into the concrete distributor.

In this position the concrete distributor can be cleaned and maintained to considerably increase the cleanliness of the pallet circulation plant.

To provide the most flexibility, the plant is equipped with a rotary vertically adjustable concrete distributor with a geometric volume of 5 cubic meters.

This enables Gocrete to quickly and reliably concrete, not only a pallet with one filling of the concrete distributor, but also raised edges in any possible direction as well as special parts.

The compaction is carried out by use of a low frequency compacting station already prepared for double-wall production.

Curing

The floor moving AS/RS is constructed for a payload of 17 tons and an hourly storage input/output of 4 pallets per hour. In addition the feeding of the floating places is also realized with this system. Moreover it is equipped with a completely walkable platform with circular guardrail and thus complies with the strict Australian safety regulations.

The curing chamber is equipped with a segment door installation. The upper chamber locations are reserved for components with raised edges up to a height of 400 mm.

Floating the Concrete Surface

At the stations U13, U07, U16 and U17 a small carousel has been installed to be used for the floating of the solid component surfaces. A floating machine has been installed that can be applied at all four stations without having to tread on either the pallet or the concrete element.

Alternatively the raised edges can also be readily treated at these station or complicated reinforcing works can yet be carried out since there is an connection to the buffer U06.

Transport, Erection and Commissioning

The plant components have been shipped from Germany and arrived despite the long transport on schedule and complete in

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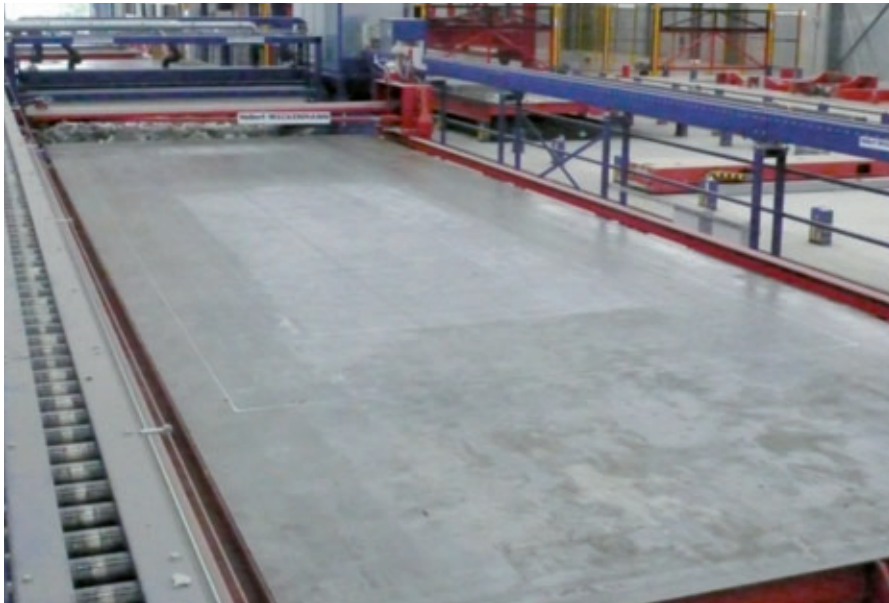


Fig. 13: Plotting station



Fig. 14: Manual shuttering



Fig. 15: Insertion of the reinforcement



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Fig. 16: Concrete and compacting station



Fig. 17: AS/RS with curing chamber

Fremantle. After completion of all clearing formalities the erection could be started in accordance with the time schedule. On the basis of the brilliant cooperation of all persons involved in the project, the 1st pallet could already be concreted one week prior to the agreed schedule.

After a comprehensive training and formation of the staff on site, the plant could be handed over to the user and the technical acceptance carried out based on the criteria defined beforehand.

By means of remote data transmission, an intervention at the plant facilities for troubleshooting is possible at any time.

Summary

Gocrete has fixed its position as the important company for high-quality precast concrete components in Western Australia with this investment and is well prepared for future challenges

Despite the large distances between Germany and Australia, all persons involved in this project from Boral, Gocrete and Vollert/Weckenmann succeeded in designing and realizing with a limited budget an extremely economical, extendable and future-oriented plant facility.



Fig. 18: Floating the concrete surfaces

FURTHER INFORMATION



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